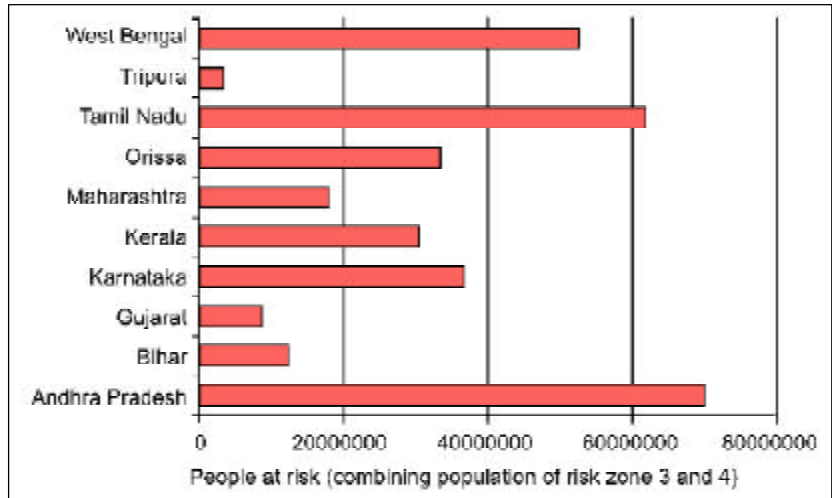


India's Vast and Vulnerable Coast

In the recorded history of cyclones, more than a million lives have been lost in India and Bangladesh in 21 cyclones in Bay of Bengal. In October 1999 two cyclones struck the state of Orissa, in the east coast of India, within a gap of fifteen days. The accompanying rains continued for two to three days more with various areas receiving rainfall in the range of 447 mm to 955 mm in coastal and central Orissa. The heavy rainfall resulted in flooding and devastated large tracts of central and northern districts. The two cyclones, with attendant rains and tidal waves left over thirteen million people affected.

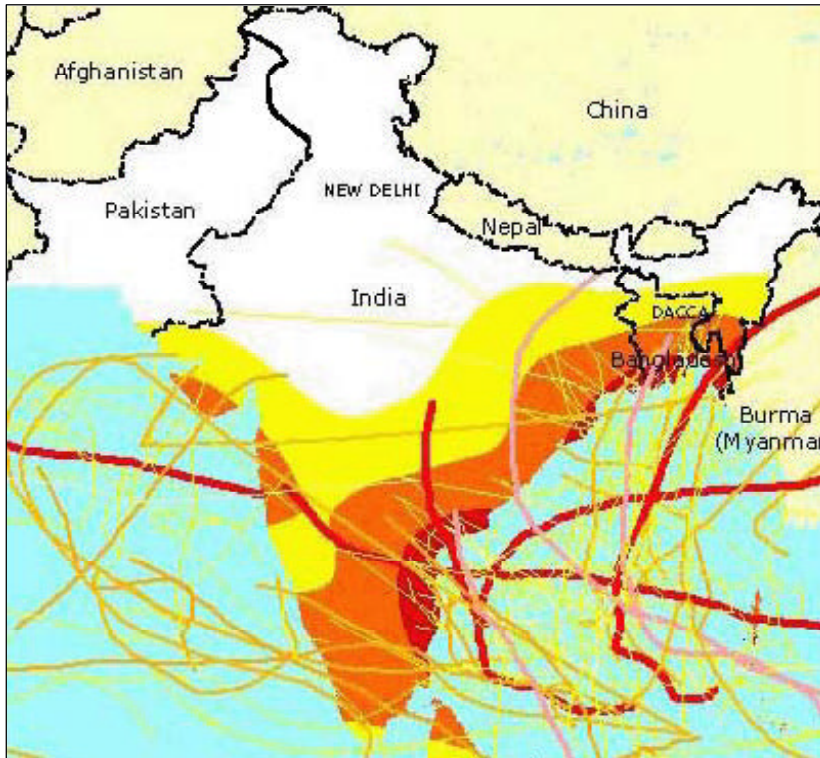


Graph shows high-risk states in India. (Courtesy: EROS Data Center)

As per official estimate, nearly eight thousand people died, although the figure is believed to be much higher. Countless animals were killed, innumerable trees uprooted, crops destroyed, individual and common property damaged, communication

links broken, services such as education, health and public distribution system disrupted and infrastructure badly damaged. As the super-cyclone struck just before harvest time, people lost their standing crops, the only source of livelihood for

majority households for this area dependent on agriculture economy. Most of the households lost their asset base such as farmers losing farmland to sand, livestock that ploughed and provided milk and artisans losing implements.



Map shows storm risk in India. Dark red are showing high risk and light yellow are showing low risk. (Courtesy: EROS Data Center)

India is one of the most densely populated countries in the world. About half of the Indian boundary is surrounded by ocean and approximately 40% of total population lives within 100 km ocean coast. The people living in the coastal regions of India are highly vulnerable to natural hazards such as cyclones.

A GIS based analysis, by Sheikh M. Nazmul Hossain and Ashbindu Singh of the USGS EROS Data Center shows that an estimated 54 million people in 20 states are extremely vulnerable to cyclones. The following graph shows high risk states where people are more vulnerable.

Using per capita income as a measure of coping capacity of the states and combining it with storm risk they conclude that Orissa is the most vulnerable, followed by Tamilnadu, Andhra Pradesh and West Bengal. Maharashtra, and Goa are less

vulnerable because of better per capita income.

Destruction from wind, tidal surge, and rain

The life span of a severe cyclonic storm in the Indian seas averages about 4 days from the time it forms until the time it enters the land. There are three elements that cause destruction, associated with a cyclone:

The very strong winds may damage installations, dwellings, communication systems, trees, etc. resulting in loss of life and property. These winds are strong enough to easily hurl helpless people and vehicles through the air, and topple fences, destroy sheds, uproot trees, and power poles, and rip roofs off houses. Many people are killed when buildings collapse and houses are blown away.

Strong winds, in turn, generate storm surges. A storm surge is an abnormal rise of sea level near the coast caused by a severe tropical cyclone. The water of a storm surge rushes inland with deadly power, flooding low-lying coastal areas, drowning people and live-stock, eroding beaches and embankments, destroying vegetation and reducing soil fertility. Loss of life is significant when surge magnitude is 3 meters or more, and catastrophic when 5 meters and above.

North Orissa, and West Bengal on the east coast are most prone to storm surges, followed by the Andhra Pradesh coast between Ongole and Machilipatnam, and the Tamil Nadu coast, south of Nagapatnam. The West coast of India is less vulnerable to storm surges than the east coast in terms of both the height of storm surge as well as frequency of occurrence. The Maharashtra coast, north of Harnai and the adjoining south Gujarat coast, and the coastal belt around the Gulf of Bombay is most vulnerable to surges on the west coast, followed

by the coastal belt around the Gulf of Kutch.

Heavy and prolonged rains due to cyclones may cause rivers to flood and inundate low lying areas, causing loss of life and property. Floods and coastal inundation due to storm surges pollute drinking water sources causing outbreak of epidemics.

When all the three factors (wind, surge and rain) occur simultaneously relief operations become difficult. This was the case in the Orissa Super-cyclone. Reports suggest a storm surge of more than 20 feet and inundation of almost 15 miles.

Recommended Mitigation and Preparedness

Since cyclones are the most predictable among all natural hazards, it is imperative that advance action is taken for relief measures before the commencement of adverse weather conditions due to cyclones. Some suggestion for doing this are:

- A comprehensive benchmark exercise to prepare a realistic contingency plan for cyclone prone coastal areas undertaking climate related disaster risk reduction, and response planning, in selected regions
- A carefully targeted analysis and incorporation of the relevant insights from global experiences on coping strategies, changing dimensions of vulnerability, financial mechanisms for risk pooling and spreading, early warning systems and other key issues in policy development in India
- Designing cyclone "adapted" infrastructure
- Strengthening early warning and communications systems
- Following disaster warning with storage of sufficient food materials for 15 days in mini go downs.
- Assessing the vulnerability of livelihoods and infrastructure in the

vulnerable regions and developing cyclone resistant livelihoods.

- Identifying communication modes and comprehensible interfaces such as mobile phone, radio, paper etc.
- Financial mechanisms for risk pooling, spreading and pre/post-disaster risk reduction
- Livelihood diversification in vulnerable areas, in ways that reduce vulnerability and increase resilience to cyclones.
- Extension of Community Based Disaster Preparedness (CBDP) activities to vulnerable communities.
- Provision of Disaster Shelter Belts in vulnerable places. These include a green belt along the coast, plantations in community land, personal land and degraded forest areas.

In an analysis of sea surface temperatures and storms since 1930, Kerry Emanuel of the Massachusetts Institute of Technology found that cyclones have grown fiercer in recent decades. A combined measure of duration and wind speeds of cyclones has nearly doubled since the 1970s; hurricane and cyclone reported durations have increased by roughly 60% since 1949; average peak storm wind speeds have increased about 50% since the 1970s.

On 20 March 2006, hurricane Larry ripped through Australia's northeast coast with winds of nearly 300km/h. One of the worst storms to hit the state of Queensland since 1931, Larry hit land at Innisfail, about 100km south of Cairns, and ripped roofs off buildings and uprooted trees across Australia's northeastern coast packing winds so powerful that emergency workers were forced to stay inside despite pleas from terrified residents. So, should we prepare for another Bay of Bengal super-cyclone this year? ■

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